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Nutrition and Well-Being

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Abstract
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Disciplines
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Nutrition and Well-Being

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ABSTRACT

The relationship of nutrition-related factors with well-being in people 80 and older has received little attention. Therefore, this chapter explores the relationships of depression and depressive symptoms, as a measure of well-being, with appetite, body weight changes, underweight, and obesity as measures of nutritional status. The sample is from the Georgia Centenarian Study (aged 80 to 89 and 98+ years, see Chapter 9). In bivariate analyses, centenarians with depression consistently had the highest prevalence of underweight when compared to centenarians without depression and all octogenarians (23% to 33% vs. 0% to 16%). When controlled for other demographic factors, clinically relevant depressive symptomatology was associated with appetite loss, while a current diagnosis of depression was associated with recent changes in body weight. However, taking antidepressant medications was not associated with any of the nutrition-related measures. Demographic factors emerged as important predictors of nutritional status. Living in a skilled nursing facility compared to living in the community was associated with a lower risk of appetite loss and higher risk of weight gain; being a centenarian or being female was associated with underweight; and being Black (vs. White) was associated with obesity. Thus, risk factors for poor nutritional status in the oldest may be related to depression as well as to specific demographic factors including age, gender, race, and residence in a skilled nursing facility.

INTRODUCTION

The World Health Organization (WHO) defines health as a state of complete physical, mental, and social well-being and not merely the absence

of disease or infirmity (Preamble to the Constitution, 1948). The WHO considers depression, which affects 121 million people worldwide, to be a major factor affecting the well-being (see Chapters 7, 8, and 11). Depression is a leading cause of disability, and it is projected that it will be the second most important cause of disability worldwide in 2020 (Murray & Lopez, 1997). Depression in the elderly not only is associated with increased morbidity and mortality but also has implications on physical, mental, social, and family functioning (United States Department of Health and Human Services [USDHHS], 1999; USDHHS Healthy People 2010; National Alliance on Mental Illness, 2009). In the United States, in older adults, depressive symptoms occur in 8–20% of community dwellers (Blazer, 2003) and in up to 44% of nursing-home residents (Teresi , Abrams, Holmes, Ramirez, & Eimicke, 2001), while major depression occurs in 1–4% of older adults (Alexopoulos, 2005), and 11% of adults 65 and older had a lifetime diagnosis of depression (Centers for Disease Control and Prevention and National Association of Chronic Disease Directors, 2008). Previous studies with centenarians have shown high prevalence rates of depressive symptoms (Martin, Rott, Kerns, Poon, & Johnson, 2000; Martin & da Rosa, 2006).

The WHO (2002) also emphasizes the importance of nutrition to help prevent and reduce disability, chronic disease, and premature mortality in older adults, and the relationship of nutrition with chronic conditions is of concern to dietitians and nutritionists (Johnson et al., 2008). Body weight, body mass index (BMI), weight loss, weight gain, and changes in appetite are often used as indices of nutritional status in older adults (Hughes, Frontera, Roubenoff, Evans, & Fiatarone Singh, 2002; Johnson et al., 2008; Vellas et al., 1999; Wallace & Schwartz, 2002), including those residing in nursing homes (Morley & Silver, 1995), and have been associated with poor well-being as defined by adverse health outcomes (Lee et al., 2006; Somes, Kritchevsky, Shorr, Pahor, & Applegate, 2002). Depression is a risk factor for nutrition-related problems in older adults (as reviewed by Brownie, 2006; Forman-Hoffman, Yankey, Hillis, Wallace, & Wolinsky, 2007; Robbins, 1989), but little is known about the relationship of depression with appetite, weight changes, and body mass index in those aged in their 80s and 100s. Thus, the purpose of this chapter is to explore these relationships in the oldest old. The primary goals are to determine the relationship of age, gender, race, nursing-home residence in a skilled nursing facility (e.g., nursing home), and depression with the nutrition-related factors. As shown in our conceptual model

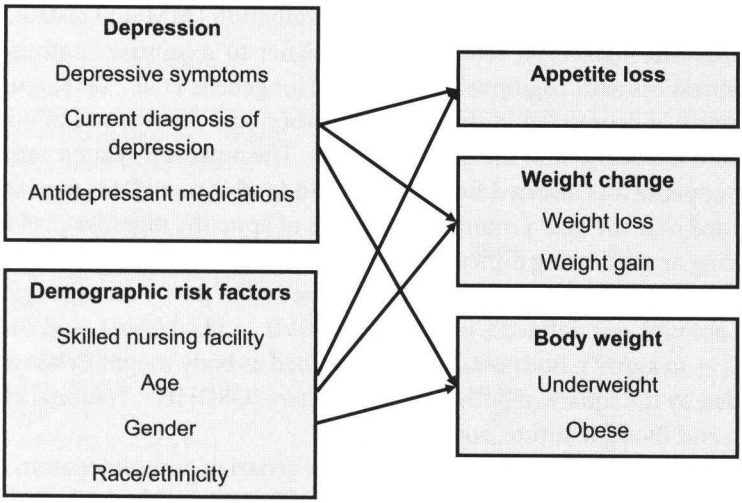

FIGURE 10.1. Nutrition and Depression Conceptual Model. It was hypothesized that depression and demographic risk factors adversely influence appetite, weight change, and body weight.

(Figure 10.1), it was hypothesized that advanced age, residence in a skilled nursing facility, and all measures of depression would be consistently associated with appetite loss, weight change, and body mass index (underweight and obesity).

METHODOLOGY

Participants were part of the Georgia Centenarian Study and included 244 centenarians (defined in this study as age 98 and older) and 80 octogenarians recruited from the community, personal-care homes, and skilled nursing facilities (Poon et al., 2007; Chapter 9). Participants were interviewed by trained personnel in their place of residence. Participants (or the caregivers of cognitively impaired participants) provided information about age, gender, race/ethnicity, living arrangements (community or skilled nursing facility), and other characteristics (e.g., depression- and nutrition-related variables). Three measures related to depression and depressive symptoms were used: clinically relevant depressive symptomatology (a score of 5 or more from the 15-item Geriatric Depression Scale [GDS]; Yesavage et al., 1982–1983; Bijl, van Marwijk, Ader, Beekman, & de Haan, 2006) in the subset

of individuals with Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) scores of 16 or higher to minimize confounding of depression with cognitive impairment (Jongenelis et al., 2005); current diagnosis of depression in the medical history; and current use of antidepressant medications in the medical history. The nutrition-related variables were appetite loss assessed from a decline in food intake ("Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?" – no loss of appetite vs. severe or moderate loss; Vellas et al., 1999), weight change in the past 3 months (gain or loss, amount not defined), underweight (BMI < 18.5 kg/m^2), and obesity (BMI ≥ 30 kg/m^2). Body mass index is defined as body weight in kilograms divided by the square of body height in meters (USDHHS, National Heart, Lung and Blood Institute, 2000).

Because of the unique nature of the octogenarian and centenarian samples, bivariate analyses of the relationships of the depression- and nutrition-related variables were conducted separately (Table 10.1).

Group differences were assessed with Student's *t*-test for continuous variables and with the chi-square test for categorical variables. Multivariate logistic regression analyses were used to explore the relationship of the nutrition-related variables in two models. Model 1 was with depression alone, and Model 2 added demographic factors that may be related to nutrition (age group, gender, race/ethnicity, and living arrangements) (Table 10.2). Analyses were conducted with the SAS statistical software (version 9.1, SAS Institute, Cary, NC). The Type I error rate was set at .05.

RESULTS

Octogenarians had an average age of 84 ($\pm$ 3) and were predominately female (66%), White (82% White, 18% Black), and resided in the community (85% community, 15% skilled nursing facility). Centenarians had an average age of 101 ($\pm$ 2) and were predominately female (85%), White (79% White, 21% Black), and resided in the community (57% community, 43% skilled nursing facility).

Table 10.1 summarizes the bivariate relationships of the nutrition-related variables with the depression-related variables in the two age groups. In octogenarians, weight change was significantly associated with a current diagnosis of depression, whereas weight gain was associated with two measures of depression (current diagnosis, antidepressant medications). In centenarians, most of the significant relationships of nutrition were with a current diagnosis of depression, which was associated with

TABLE 10.1. *Depression, appetite, weight change, underweight, and obesity in octogenarians and centenarians: Georgia Centenarian Study*

Clinically relevant depressive symptomatology[a]	Octogenarians		Centenarians	
	GDS < 5	GDS ≥ 5	GDS < 5	GDS ≥ 5
Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties? (n)	*60*	*7*	*112*	*22*
Appetite loss (%)	6.7	28.6+	7.1	22.7*
Change in body weight in the past 3 months? (n)	*60*	*7*	*110*	*20*
Weight change: gain or loss (%)	28.3	57.1	28.2	30.0
Weight gain (%)	13.3	14.3	10.0	5.0
Weight loss (%)	15.0	42.9+	18.2	25.0
BMI (kg/m²) (n)	*57*	*7*	*112*	*22*
Underweight BMI < 18.5 (%)	5.3	0	10.7	22.7
Obesity BMI ≥ 30 (%)	12.3	0	4.5	0
Current diagnosis of depression (from medical history)	**No**	**Yes**	**No**	**Yes**
Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties? (n)	*68*	*10*	*204*	*34*
Appetite loss (%)	7.4	20.0	13.2	0.0*
Change in body weight in the past 3 months? (n)	*67*	*10*	*197*	*32*
Weight change: gain or loss (%)	28.4	70.0**	32.5	56.3**
Weight gain (%)	11.9	40.0*	12.2	25.0+
Weight loss (%)	16.4	30.0	20.3	31.3
BMI (kg/m²) (n)	*65*	*10*	*197*	*33*
Underweight BMI < 18.5 (%)	3.1	10.0	15.2	33.3*
Obesity BMI ≥ 30 (%)	12.3	0	5.6	3.0
Antidepressant medications taken currently	**No**	**Yes**	**No**	**Yes**
Has food intake declined over the past three months due to loss of appetite, digestive problems, chewing or swallowing difficulties? (n)	*68*	*12*	*195*	*49*
Appetite loss (%)	11.8	0.0	12.8	6.1
Change in body weight in the past 3 months? (n)	*67*	*12*	*188*	*47*
Weight change: gain or loss (%)	31.3	50.0	33.5	40.4
Weight gain (%)	10.5	41.7**	13.3	14.9
Weight loss (%)	20.9	8.3	20.2	25.5
BMI (kg/m²) (n)	*65*	*12*	*187*	*49*
Underweight BMI < 18.5 (%)	3.1	8.3	16.0	24.5
Obesity BMI ≥ 30 (%)	12.3	8.3	4.8	6.1

[a]Defined as a score of 5 or more on the Geriatric Depression Scale (GDS) in those with MMSE ≥ 16.
*$p < 0.05$. **$p < 0.01$. ***$p < 0.001$. +$p > 0.05$ and < 0.10.

TABLE 10.2. *Logistic regression analyses of depression, appetite, weight loss, underweight, and obesity: Georgia Centenarian Study*

	Appetite loss (moderate or severe vs. no loss) OR (95% CI)	Weight change (weight gain or loss vs. no change) OR (95% CI)	Weight gain (weight gain vs. loss or no change) OR (95% CI)	Weight loss (weight loss vs. gain or no change) OR (95% CI)	Underweight (BMI <18.5 vs. ≥18.5) OR (95% CI)	Obesity (BMI ≥30 vs. <30) OR (95% CI)
Depressive symptoms[a]	201	197	197	197	198	-[e]
1) Depression[b]	4.24 (1.51, 11.92)**	1.50 (0.64, 3.50)	0.64 (0.14, 2.90)	2.05 (0.82, 5.13)	2.14 (0.71, 6.42)	
2) Depression	4.25 (1.49, 12.11)**	1.43 (0.59, 3.48)	0.46 (0.09, 2.39)	2.01 (0.79, 5.08)	1.99 (0.64, 6.18)	
Age (98+ vs. 80s)	0.98 (0.34, 2.79)	0.66 (0.32, 1.35)	0.32 (0.10, 1.08)	0.98 (0.44, 2.22)	2.03 (0.54, 7.63)	
Female vs. male	0.89 (0.29, 2.69)	0.69 (0.34, 1.42)	0.47 (0.17, 1.30)	0.98 (0.42, 2.30)	6.51 (0.83, 51.01)	
Black vs. White	0.88 (0.19, 4.20)	1.18 (0.47, 2.97)	1.13 (0.29, 4.49)	1.12 (0.39, 3.22)	-[d]	
Skilled nursing facility vs. community	-[c]	3.02 (1.37, 6.65)**	7.82 (2.22, 27.50)**	1.32 (0.54, 3.27)	2.31 (0.84, 6.40)	
Current diagnosis of depression (n)	316	306	306	306	305	305
1) Depression	0.36 (0.08, 1.55)	3.21 (1.64, 6.26)***	2.90 (1.35, 6.23)**	1.87 (0.91, 3.85)	2.78 (1.30, 5.96)**	0.31 (0.04, 2.34)
2) Depression	0.55 (0.11, 2.61)	2.30*(1.09, 4.82)	1.99 (0.84, 4.74)	1.60 (0.72, 3.57)	1.70 (0.71, 4.07)	0.31 (0.04, 2.59)
Age (98+ vs. 80s)	1.52 (0.61, 3.79)	0.82 (0.45, 1.51)	0.54 (0.24, 1.25)	1.14 (0.56, 2.30)	3.84 (1.11, 13.27)*	0.39 (0.14, 1.06)
Female vs. male	1.66 (0.60, 4.63)	0.70 (0.37, 1.33)	0.73 (0.30, 1.74)	0.80 (0.39, 1.64)	4.37 (1.00, 19.05)*	2.83 (0.61, 13.13)
Black vs. White	0.67 (0.24, 1.86)	1.70 (0.93, 3.11)	2.10 (0.98, 4.47)	1.12 (0.56, 2.24)	0.62 (0.25, 1.54)	2.80 (1.05, 7.45)*
Skilled nursing facility vs. community	0.35 (0.13, 0.95)*	2.79 (1.60, 4.89)***	3.74 (1.72, 8.17)***	1.55 (0.82, 2.93)	1.96 (0.93, 4.12)	0.89 (0.30, 2.63)

Medications (n)	324	314	314	314	313	313
1) Depression	0.36 (0.11, 1.22)	1.50 (0.84, 2.67)	1.78 (0.85, 3.71)	1.10 (0.56, 2.19)	1.86 (0.91, 3.81)	0.97 (0.31, 2.99)
2) Depression	0.45 (0.13, 1.57)	1.06 (0.56, 2.00)	1.20 (0.54, 2.68)	0.91 (0.44, 1.87)	1.24 (0.58, 2.68)	1.25 (0.37, 4.21)
Age (98+ vs. 80s)	1.47 (0.62, 3.48)	0.70 (0.39, 1.28)	0.51 (0.22, 1.16)	0.98 (0.49, 1.94)	3.73 (1.09, 12.76)*	0.38 (0.14, 1.00)
Female vs. male	1.46 (0.56, 3.78)	0.83 (0.44, 1.55)	0.83 (0.35, 1.95)	0.91 (0.45, 1.84)	4.72 (1.09, 20.45)*	1.75 (0.48, 6.42)
Black vs. White	0.62 (0.23, 1.71)	1.52 (0.84, 2.76)	1.92 (0.91, 4.02)	1.03 (0.52, 2.04)	0.59 (0.24, 1.44)	3.00 (1.14, 7.86)*
Skilled nursing facility vs. community	0.34 (0.13, 0.88)*	3.48 (2.03, 5.99)***	4.45 (2.07, 9.54)***	1.84 (1.002, 3.37)*	2.14 (1.07, 4.27)*	0.69 (0.23, 2.05)

[a] Clinically relevant depressive symptomatology, defined as a score of 5 or more on the Geriatric Depression Scale (GDS) in those with MMSE $\geq$ 16.

[b] Two models were analyzed for each measure of depression: 1) depression only and 2) depression and demographic factors (centenarians vs. octogenarians; female vs. male; Black vs. White; and skilled nursing facility vs. community). Statistical significance indicated by $^{*}p < 0.05$, $^{**}p < 0.01$, and $^{***}p < 0.001$.

[c] Odds ratio could not be calculated because appetite loss was not reported in any nursing home residents.

[d] Odds ratio could not be calculated because no Blacks were underweight.

[e] Odds ratio could not be calculated because no participants with GDS $\geq$ 5 and MMSE $\geq$ 16 were obese.

significantly less appetite loss, more weight change, and more underweight. Appetite loss was more common in centenarians with clinically relevant depressive symptomatology (GDS $\geq$ 5) compared with those with GDS $<$ 5.

Table 10.2 summarizes the logistic regression analyses and odds ratios (OR) and 95% confidence intervals (CI) are reported. Depressive symptoms, but not other measures of depression, were associated with a threefold greater risk of appetite loss, even when controlled for other factors. Current diagnosis of depression was associated with a two- to threefold greater risk of weight change, even when controlled for other factors. The association with weight gain was attenuated when controlled for other factors. Although current diagnosis of depression was associated with a higher risk of underweight, this effect was attenuated in the multivariate model. No measure of depression was associated significantly with weight loss or with obesity. Compared with the other demographic factors, residence in a skilled nursing facility was the most likely variable to be associated significantly with nutrition; residing in a skilled nursing facility (vs. the community) generally protected against appetite loss, but increased the risk of weight change or weight gain. In the models with antidepressant medications, residence in a skilled nursing facility was also associated with a highest risk of weight loss or underweight.

DISCUSSION

The nature of the relationship of nutrition with depression and depressive symptoms differed markedly across each of these measures. As illustrated in Figure 10.2, four distinct relationships were identified in the final regression models: none of the nutrition-related measures was associated with taking antidepressant medications; appetite loss was associated with having depressive symptoms (GDS of 5 or more) but not with the other depression measures; weight change was associated with a current diagnosis of depression but not with the other depression measures; and underweight and obesity were not robustly associated with any depression measure. It is also noteworthy that there was a lower likelihood of appetite loss and higher likelihood of weight gain associated with residing in a skilled nursing facility. Last, underweight was associated with being a centenarian (vs. octogenarian) or being female, whereas obesity was associated with being Black (vs. White). The significance and implications of these findings are discussed herein.

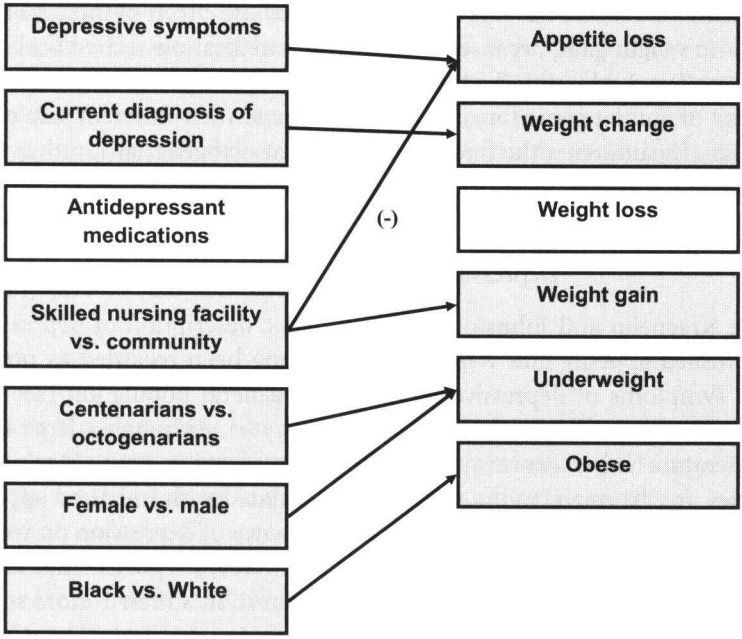

FIGURE 10.2. Nutrition and Depression in the Georgia Centenarian Study. Observed relationships of multiple measures of depression, place of residence, age, gender, and race/ethnicity with appetite loss, weight loss, weight gain, underweight, and obesity (from multivariate regression modeling).

Antidepressant Medications and Nutrition-Related Variables

Depression is a highly treatable disorder. Once diagnosed, depression can be treated in a number of ways, including with medications. Antidepressant medications normalize endogenous levels of the neurotransmitters serotonin and norepinephrine in the brain, whose levels are thought to be diminished in depressed patients. Through this mechanism, a variety of medications have been developed to help patients regain their quality of life. Some of these are known to cause weight gain (tricyclic antidepressants, the selective serotonin reuptake inhibitor [SSRI] paroxetine, mirtazapine; Zimmermann, Kraus, Himmerich, Schuld, & Pollmaecher, 2003). In the multivariate regression modeling, weight gain was not associated with taking antidepressant medications. However, in the bivariate analyses, weight gain was associated with taking antidepressant medications in the octogenarians but not the centenarians. Perhaps for many centenarians, their

residence in a skilled nursing facility attenuated the effects of these medications on weight gain, because nutrition- and medication-related problems are monitored. Also, this study did not have adequate power to examine the variety of antidepressant medications in use and their different side effect profiles. In summary, the findings suggest that octogenarians, rather than centenarians, may be at risk of weight gain from antidepressant medications.

Depression, Appetite, and Weight

Since Kraepelin and Johnstone's (1904) classic description of depression, diminished appetite and weight loss have long been regarded as prominent symptoms of depressive illness in the general population (see also Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). Although a large body of literature exists concerning the anorexia of aging (e.g., Macintosh, Morley, & Chapman, 2000) and factors associated with impaired appetite in older adults, little is known about the influence of depression on weight and appetite in the oldest old. Brodaty et al. (1997) reported that adults older than age 60 diagnosed with major depression suffered more severe appetite loss than did adults younger than age 60. Lee et al. (2006) concluded that symptomatic depression in older adults aged 70–79 years was significantly related to impaired appetite. Weight changes and appetite loss can be behavioral symptoms indicating depressive symptoms or major depressive disorder as defined by the American Psychiatric Association's (2000) *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV, 4th ed.). Weight or appetite changes, however, are not required for a depression diagnosis. The link between depression and weight change and appetite loss may be due to one condition causing the other because of psychological or biological mechanisms or due to a third condition or consequence related to weight change, appetite change, and depression (as reviewed by Forman-Hoffman et al., 2007). Our consistent finding of appetite loss in those with depressive symptoms extends the observations of Lee et al. (2006) in younger elders (70–79 years) to those in their 80s and beyond.

Appetite and Weight Loss in Skilled Nursing Facilities

A lower likelihood of appetite loss and a higher likelihood of weight gain were consistently seen in those residing in skilled nursing facilities than in community-dwelling participants. The reason for this may be that skilled nursing facilities in Georgia and the United States as a whole are strictly regulated by the state and federal government to be licensed or to receive

Medicare or Medicaid reimbursement for services (Code of Federal Regulations, 2005). These regulations are designed to promote and protect the health, safety, and well-being of the residents. Part of the requirement is to monitor nutritional status and to provide adequate nutrition. Consequently, residents of skilled nursing facilities may be more likely to gain weight than community-dwelling older adults. We have also reported that the dietary quality of these centenarians is higher among those residing in skilled nursing facilities rather than in the community (Johnson, Davey, Hausman, Park, & Poon, 2006).

Underweight

Although underweight was higher in centenarians with depression than in those without depression and the octogenarians, depression did not emerge as risk factors for underweight in the multivariate regression models. However, underweight was about four times more prevalent in centenarians (than in octogenarians) and women (than in men). Underweight is a risk factor for morbidity and mortality (Miller et al., 2009), so it is important to monitor weight status in older adults. Elucidating other underlying reasons for underweight, it has been proposed by Roubenoff (1999) that weight loss in older adults can be divided into three distinct types. First, wasting is an involuntary loss of weight, which is primarily caused by inadequate dietary intake. This may be attributable to both disease and psychosocial factors, and it may occur with a background of cachexia or sarcopenia, or both. Second, cachexia is an involuntary loss of fat free mass or body cell mass, which is caused by catabolism and results in changes in body composition but in which weight loss may not be initially present. It is characterized by an elevated metabolic rate and increased protein degradation. Last, sarcopenia is an involuntary loss of muscle mass, which may be an intrinsic part of the aging process rather than the effect of age associated with disease (Roubenoff, 1999; 2003). So even though depression was not associated with underweight in this study, it is important to monitor weight status in the oldest old because of its many associations with other indices of well-being.

Obesity

The prevalence of obesity in this sample of the oldest old was very low and was not associated with depression. However, the risk of being obese was about three-fold higher in Blacks compared to Whites. Thus, the high risk

of obesity in Blacks in the United States (Wang, Colditz, & Kuntz, 2007) extends even into the oldest age groups. Obesity throughout the life cycle is associated with increased morbidity from a variety of chronic conditions, such as disability and impaired mobility, diabetes, hypertension, and heart disease (USDHHS, NHLBI, 2000; Penn, Fischer, Lee, Hausman, & Johnson, 2009).

CONCLUSION

Some limitations of this study are the relatively small number of participants and the cross-sectional nature of the study. Longitudinal studies are needed to ascertain the causal and temporal relationships of nutrition and depression over time. Also, our measure of appetite was rather broad, so future studies should define this measure more specifically.

In conclusion, the findings suggest that the nature of the relationships between nutrition and depression depends on how each domain is conceptualized and measured. Importantly, residence in a skilled nursing facility was protective against appetite loss and was associated with weight gain (rather than weight loss), which supports our earlier findings of higher dietary quality in residents of skilled nursing facilities than of those in the community (Johnson et al., 2006). Depressive symptoms were strongly predictive of appetite loss, whereas advanced age and being female was associated with underweight. By any measure of depression, depressed centenarians seemed to be at the highest risk for an impaired nutritional status, because they had the highest prevalence of underweight compared to nondepressed centenarians as well as octogenarians (depressed or nondepressed). As a consequence, this may call for more awareness of the detection and treatment of depression to maintain well-being in the oldest old.

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